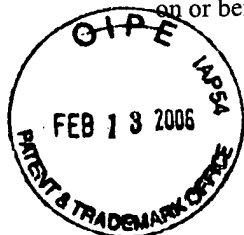


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*Charles W. Stewart*  
Charles W. Stewart

Date: *9 February 2006*

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE BOARD OF APPEALS AND INTERFERENCES

In re application of )

GUY BARRE, JEAN-PAUL DARNANVILLE, )  
and LAURENT GEORGES HUVE )

Serial No. 09/856,022 )

Filed May 16, 2001 )

CATALYTIC DEWAXING PROCESS )

Group Art Unit: 1764

Examiner: Walter Dean Griffin

COMMISSIONER FOR PATENTS  
P. O. Box 1450  
Alexandria, VA 22313-1450

Sir:

**APPEAL BRIEF**

This brief is filed in support of the Applicants' appeal from the Examiner's action dated July 20, 2005, finally rejecting claims 1, 3, 5-10 and 14-44, which are all of the claims remaining in the above-identified U.S. patent application. The Applicants filed a Notice of Appeal on January 20, 2005 along with a Petition for an extension of time.

This Appeal Brief is filed in triplicate. Please charge the fee set forth in Section 41.20(b)(2) to Shell Oil Deposit Account No. 19-1800.

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**REAL PARTY IN INTEREST**

The invention described and claimed in the above-identified patent application is assigned to Shell Oil Company, which is the real party in interest in the present appeal.

## **RELATED APPEALS AND INTERFERENCES**

Appellant and Appellant's legal representative are not aware of any appeals or interferences that directly affect or could be directly affected by or have a bearing on the Board's decision in the present appeal.

## **STATUS OF CLAIMS**

Claims 1, 3, 5-10 and 14-44 have been finally rejected, and they are the subject of this appeal.

Claims 2, 4, and 11-13 have been cancelled.

## **STATUS OF AMENDMENTS**

No amendment has been filed subsequent to the Examiner's final office action that was mailed July 20, 2005. Instead, a Notice of Appeal from the Examiner's final rejection of claims 1, 3, 5-10 and 14-44 has been filed. Thus, the claims involved in this appeal are the claims that were pending at the time of the final office action on July 20, 2005. A copy of these claims is contained in the Claims Appendix.

## **SUMMARY OF CLAIMED SUBJECT MATTER**

There are four independent claims 1, 17, 27, 36 among the claims that are the subject of this appeal.

Claim 1 is directed to a process for catalytically dewaxing a hydrocarbon oil feed. See e.g. page 1, lines 2-3; page 3, lines 11-12; page 4, lines 2-16; page 5, lines 29-33; page 8, lines 28-30; page 11, lines 22-24. The hydrocarbon oil feed that is subjected to the catalytic dewaxing is defined as having certain specific properties, and it is specified as being obtained by a specific process. See e.g. page 4, lines 22-35. The hydrocarbon oil feed is to have a boiling range between 300 °C and 620 °C, to contain waxy molecules, and more than 1000 ppmw of sulphur or sulphur containing compounds. See e.g. page 4, lines 22-35 and page 8, lines 3-25. The hydrocarbon oil feed is to be obtained by the vacuum distillation of the residue of an atmospheric distillation of a crude petroleum feedstock. See page 4, lines 22-30. A feature of the catalytic dewaxing process is the negative requirement that the hydrocarbon oil feed has not been subjected to a hydrotreating step to reduce its sulfur and nitrogen content prior to contacting it with the catalyst

composition under catalytic dewaxing conditions. See page 5, lines 29-33. The catalyst composition of the catalytic dewaxing process comprises a Group VIII metal hydrogenation component selected from the group consisting of platinum, palladium and nickel, dealuminated aluminosilicate zeolite crystallites and a low acidity refractory oxide binder material which is essentially free of alumina. See page 1, lines 5-7; page 3, lines 15-19; page 9, lines 4-9; page 11, lines 22-30.

The process of claim 17 is the same process as defined by claim 1; except, however, that, the catalyst composition with which the hydrocarbon oil feed is contacted under catalytic dewaxing conditions comprises a nickel hydrogenation component, dealuminated aluminosilicate zeolite crystallites and a low acidity refractory oxide binder material which is essentially free of alumina. See page 13, lines 12-33; page 16, lines 5-9.

Claim 27 is directed to a catalytic dewaxing process which includes contacting a solvent extracted waxy raffinate that has not been subjected to a hydrotreating step to reduce its sulfur and nitrogen content, under catalytic dewaxing conditions, with a catalyst composition comprising dealuminated aluminosilicate zeolite crystallites, a low acidity refractory oxide binder material which is essentially free of alumina, and a Group VIII metal hydrogenation component selected from the group consisting of platinum, palladium and nickel. See page 1, lines 5-7; page 3, lines 15-19; page 9, lines 4-9; page 11, lines 22-30. The solvent extracted waxy raffinate is made by vacuum distilling a residue from an atmospheric distillation of a crude petroleum feedstock that contains a sulfur compound and nitrogen compound to yield a vacuum distillate having a boiling range between 300 °C and 620 °C and subjecting the vacuum distillate to a solvent extraction with a solvent to thereby yield a solvent extracted waxy raffinate. The solvent extracted waxy raffinate has a reduced aromatics content relative to that of the vacuum distillate, and it contains waxy molecules and more than 1000 ppmw of sulfur and sulfur containing compounds. See page 4, line 22 - page 5, lines 7 and 29-33.

Claim 36 is directed to a catalytic dewaxing process which includes contacting a vacuum distillate that has not been subjected to a hydrotreating step to reduce its sulfur and nitrogen content, under catalytic dewaxing conditions, with a catalyst composition comprising dealuminated aluminosilicate zeolite crystallites, a low acidity refractory oxide binder material which is essentially free of alumina, and a Group VIII metal hydrogenation component selected from the group consisting of platinum, palladium and nickel. See page 5, lines 29-33. The vacuum distillate is made by vacuum distilling a residue from an atmospheric distillation of a

crude petroleum feedstock that contains a sulfur compound and a nitrogen compound to yield the vacuum distillate having a boiling range of between 300 °C and 620 °C and contains more than 1000 ppmw of sulfur or sulfur containing compounds. See page 4, lines 22-35.

One difference between the processes of claim 27 and claim 36 is in the feedstocks that are to be catalytically dewaxed. The feedstock of the process of claim 36 to be catalytically dewaxed is a vacuum distillate, but, on the other hand, the feedstock of the process of claim 27 to be catalytically dewaxed is a vacuum distillate that has been subjected to a solvent extraction.

## **GROUND OF REJECTION TO BE REVIEWED ON APPEAL**

The rejection of claims 1, 3, 5-10, and 14-44 under 35 U.S.C. §103(a) as being unpatentable over EP 113381 to Banta et al in view of WO 98/01515 to Moureaux and U.S. Patent No. 4,376,036 to Garwood et al.

## **ARGUMENT**

Rejection under 35 U.S.C. §103(a) over EP 113381 to Banta et al in view of WO 98/01515 to Moureaux and U.S. Patent No. 4,376,036 to Garwood et al.

### **A. Summary of the Cited Prior Art**

#### *The Banta Publication (EP 0 133 381)*

The Banta publication discloses a process for the simultaneous dewaxing and desulfurization of heavy petroleum oils. See e.g., page 1, first paragraph; and page 2. Banta teaches that its catalyst composition preferably contains from 70 to 95% alumina, silica or silica-alumina support material and from 5 to 30% zeolite. See page 3, lines 28-33. Banta further teaches that it is significant that the amount of zeolite in its catalyst composition is preferably restricted to a relatively low level, see page 3, lines 31-34, because, as Banta indicates, large amounts of zeolite may negatively affect the desulfurization activity of the catalyst without having any compensating effect on its dewaxing activity. See page 3, line 34 – page 4, line 2.

Throughout its examples, the Banta publication notes that the presence of up to a certain percentage amount of zeolite in the Banta catalyst provides for the reduction of the pour point reduction of certain feeds, but it does not provide for a reduction of sulfur content. See e.g. page 8, lines 1-2; and page 13, second and last paragraphs. Banta also teaches that its catalyst requires the presence of Group VIA and/or Group VIII metal compounds to provide a hydrogenation

function for desulfurization. See page 4, lines 3-14; and page 13, last paragraph. The preferred Group VIA metals are tungsten and molybdenum, and the preferred Group VIII metals are cobalt and nickel. See page 4, lines 8-10. The especially preferred combination of metals is nickel and molybdenum, both as oxides. See page 4, lines 10-12.

In the examples of the Banta publication it is suggested that the catalyst of the invention should contain a certain maximum amount of zeolite and both nickel and molybdenum components. For instance, Banta states that “[t]he hydrogenation function, attributable to the nickel (or cobalt) and molybdenum is also needed in the catalyst.” See page 13, last paragraph. And, supporting this statement, Banta states that its catalyst containing nickel and molybdenum with only 30% ZSM-5 was much more effective for both dewaxing and desulfurization than a catalyst containing a greater amount (65%) of ZSM-5 zeolite but with only 1% nickel. See page 14, second paragraph of Example 4. The catalysts described in the Banta examples each contain alumina as the support material. See Examples 1-8.

In summary, Banta teaches that only up to a certain content level of ZSM-5 in its catalyst is there provided a dewaxing benefit and that the use of the ZSM-5 alone does not provide a desulfurization benefit. Also, Banta teaches that the presence of nickel alone in its catalyst does not provide for as much of a desulfurization benefit as does the presence of both nickel and molybdenum. The Banta publication nowhere teaches the need to use a surface dealuminated aluminosilicate zeolite with a low acidity refractory oxide binder material that is essentially free of alumina; but, instead, Banta indicates that a large proportion of its catalyst may include alumina.

*The Moureaux Publication (WO 98/01515)*

The Moureaux publication discloses a process for the preparation of lubricating base oils that necessarily includes two reaction stages with an intermediate separation step between the two reaction stages. See Abstract; page 1, lines 2-8; page 5, lines 7-25; page 9, lines 30-32; page 10, line 31-page 11, line 18; page 17, line 31-page 18, line 4; claim 1; and Figures 1 and 2. The first reaction stage is a hydrotreating step used to remove sulfur and nitrogen from a hydrocarbon feed using a catalyst comprising both a Group VIB metal component and a non-noble Group VIII metal component supported on a refractory oxide carrier. See page 5, lines 10-14; page 6, line 14-page 7, line 20. The importance of the sulfur and nitrogen removal reaction step is emphasized. See page 9, line 1-page 10, line 3. It is noted that the noble-metal based

catalyst used in the second reaction step is sensitive to poisoning by sulfur and nitrogen. *See* page 9, lines 9-15.

The product from the first reaction step is to be separated into a gaseous fraction and a liquid fraction. *See* page 9, lines 30-32. The first reaction step is to be operated so as to provide the liquid fraction having less than 1000 ppmw sulfur and less than 50 ppmw nitrogen. *See* page 9, lines 1-7; page 9, line 32-page 10, line 3. But, it is preferred for these concentrations to be much lower such as less than 500 ppmw sulfur and less than 30 ppmw nitrogen. *Ibid.*

The second reaction stage may provide the two functions of hydrofinishing (hydrogenation of aromatics) and hydrodewaxing (hydroisomerization), or a single function of hydrofinishing alone, configured in a variety of ways. *See* page 10, line 31-page 11, line 33. The dewaxing catalyst may be selected from those known in the art, such as, dewaxing catalysts comprising a noble metal (platinum or palladium) supported on an intermediate pore size zeolitic material. Another class of dewaxing catalyst comprises a noble metal component supported on a surface deactivated aluminosilicate.

A significant aspect of the teachings of the Moureaux publication is that the first reaction stage of the process is necessary so as to provide for the removal of sulfur from sulfur-containing feedstocks in order to protect the noble metal based catalyst of the second reaction stage. The dewaxing catalyst of the Moureaux publication contains a noble Group VIII metal component supported on a surface dealuminated aluminosilicate as disclosed in European patent application EP 0 832 171. This noble metal based catalyst is sensitive to being poisoned by sulfur and nitrogen contaminants in a feedstock to be treated which is the reason for the desulfurization stage of the Moureaux process.

*The Garwood et al. Patent (U.S. 4,376,036)*

In the background section of the Garwood patent it states that the current practice in preparing a high-grade distillate lubricating oil is by the dewaxing of a raffinate from the solvent extraction of a raw stock material resulting from the vacuum distillation of an atmospheric tower residuum. *See* column 2, lines 8-20. Garwood et al. describe their invention as being a process for the catalytic dewaxing of a distillate petroleum fraction using a silica-modified ZSM-5 type zeolite. *See* e.g. column 3, lines 40-46 and the claims. The preferred embodiment involves the catalytic dewaxing of a raffinate from a solvent extraction step. *See* column 4, lines 11-20. This catalytic dewaxing is conducted by contacting the raffinate under appropriate dewaxing conditions with the silica-modified ZSM-5 type zeolite. The silica-modified ZSM-5 includes

from 0.1 to about 30 weight percent silica that has been added to the zeolite by treatment with either an organic silicone compound or an organic silane compound, or both. See column 4, line 51 – column 5, line 7.

It is significant in the teachings of the Garwood et al. patent that the distillate petroleum fraction that is subjected to catalytic dewaxing is subjected to a solvent extraction step prior to the catalytic dewaxing step. Concerning the catalyst, there is no mention that the silica-modified ZSM-5 zeolite catalyst may contain a Group VIII metal, and the dewaxing process requires the use of a silica-modified zeolite.

## **B. Response to the Examiner's Arguments**

The Examiner acknowledges that the primary reference of Banta does not disclose the use of a dewaxing catalyst containing a dealuminated zeolite or the dewaxing of a feed obtained by the vacuum distillation of an atmospheric residue followed by a solvent extraction. However, the Examiner argues that one skilled in the art would have modified the process of Banta by using the teachings of the Garwood patent to provide a feedstock for catalytic dewaxing that is a vacuum distillate of an atmospheric residue that has been extracted with a solvent. The Examiner argues that one skilled in the art would further modify the Banta process by using the teachings of the Moureaux publication to change the dewaxing catalyst that the Banta patent specifies for use in its process to include a dealuminated aluminosilicate zeolite. The substitution of the Garwood feedstock for the Banta feedstock is argued by the Examiner to be proper because the Garwood feed allegedly has an appropriate boiling range for the preparation of the desired products of the Banta publication. As for the substitution of the dealuminated zeolite-containing dewaxing catalyst taught by the Moureaux publication for use in the process of the Banta publication, the Examiner circularly argues that such a substitution is obvious because the catalyst has dewaxing activity that is essential to the process of the Banta patent.

The applicant's submit that the teachings of Banta and those of Moureaux are in such conflict that it is improper to combine them in the way the Examiner has done. For instance, the Banta invention is directed to a process for the simultaneous hydrodesulfurization and hydrodewaxing of a feedstock having a high sulfur content. But, on the other hand, the Moureaux teachings are concerned with a process that particularly provides for the reduction of the sulfur content of a dewaxing feedstock prior to subjecting it to a catalytic dewaxing step that uses a sulfur sensitive dewaxing catalyst comprising a noble metal component supported on an

amorphous refractory oxide carrier. Thus, one would not be lead to use the sulfur sensitive dewaxing catalyst of the Moureaux publication as a substitute for the catalyst of the Banta publication for use in simultaneous hydrodesulfurization and hydrodewaxing since the Banta catalyst is being used to treat a high sulfur content feedstock.

In another example of the conflict between the teachings of Banta and those of Moureaux, Banta teaches that its catalyst should contain a relatively low amount of zeolite, preferably in the range of from 5 to 30%; but, in contrast, Moureaux, by its reference to the European patent specification no. 96921992.2, indicates that its dewaxing catalyst may contain a weight ratio of modified molecular sieve to binder in the range of from 10/90 to 90/10, and most preferably from 50/50 to 80/20. Aside from the major differences in the forms of the zeolites used in the two different catalysts, it is preferred for the Banta catalyst to have a low amount of zeolite but for the Moureaux catalyst to have a high amount of zeolite.

Still another difference between the teachings of Banta and Moureaux is that the Banta catalyst contains a non-noble Group VIII metal whereas the Moureaux catalyst is a noble metal-containing catalyst. Banta indicates that its preferred metal combination is nickel and molybdenum that provides for the hydrogenation function for desulfurization. On the other hand, the Moureaux catalyst contains a noble metal that is sensitive to sulfur poisoning.

It is additionally noted that the catalyst disclosed in the European specification no. 96921992.2 (Grandvallet) as referenced by Moureaux contains a noble metal component supported on a surface dealuminated aluminosilicate zeolite and that the binder that is used in forming the catalyst should be essentially free of aluminum, thus, the list of suitable binder materials for such catalyst does not include alumina. See Grandvallet at page 5, lines 18-25. But, Banta indicates that its catalyst may contain from 20 to 99% alumina mixed with a ZSM-5 type zeolite. Based on these teachings, it is improper to combine the dealuminated zeolite of the Moureaux catalyst (i.e. the catalyst described in Grandvallet) for the zeolite of the Banta catalyst since it is taught that the alumina should not be present in the catalyst. See Grandvallet at page 5, lines 18-25.

Considering the above-noted differences and conflicts between the teachings of Banta and of Moureaux, the applicant respectfully submits that they are not properly combinable.

Concerning the application of the Garwood patent, the Examiner argues that its teachings that a feedstock obtained from the solvent extraction of a vacuum distillate of an atmospheric resid may be catalytically dewaxed may be used to modify the Banta process so that it includes



the processing of such a feedstock. The problem with this combination is that there is nothing in the teachings of the two references to suggest it. The dewaxing catalysts taught in the two references are substantially different and there is no mention in Garwood of its feed containing sulfur. And, if anything, the requirement in Banta that its catalyst must contain a metal that provides a hydrogenation function should prevent the combining of the references since the dewaxing catalyst of Garwood is merely a silica-modified zeolite. There is no indication in Garwood that its catalyst is useful in the desulfurization of a feedstock, and according to the Banta teachings, a catalyst containing only zeolite does not provide desulfurization activity.

Considering the above-noted differences between the teachings of Banta and of Moureaux, the applicants respectfully submit that they are not properly combinable.

Even if the three cited references are combinable in the way suggested by the Examiner, it is submitted that such a combination will not provide applicant's taught process. Applicants' invention is directed to a catalytic dewaxing process that uses a catalyst that is less sensitive to sulfur poisoning than alternative dewaxing catalysts and is therefore capable of handling a feedstock having a high sulfur concentration. This is significantly different from the process of Banta that simultaneously desulfurizes and dewaxes a high sulfur feedstock. As is indicated in the applicant's specification, the catalytically dewaxed product is what is desulfurized instead of the feed to the catalytic dewaxing step. See applicants' spec at page 6, lines 10-13 and page 7, lines 15-18. To illustrate this, the applicants present in their specification an example demonstrating the advantages of first conducting a catalytic dewaxing step prior to a hydrodesulfurization step. See Examples 5 and 6. Another problem with the Examiner's combination of references is that the catalyst of Banta requires a relatively low zeolite content while the applicants' catalyst may have a high zeolite content. See applicants' spec at page 11, lines 28-30. Also, the binder material of the applicants' catalyst is a low acidity refractory oxide material which is essentially free of alumina, see applicants' spec at page 9, lines 4-9; page 11, lines 22-28; and Examples 1-3, whereas the Banta catalyst may include a significant amount of alumina. The applicants have shown in their examples that the significant presence of alumina in its dewaxing catalyst is not desired.

#### **Claims 1, 3, 36, and 37**

The recited catalyst of the dewaxing step of the claimed process comprises the three components of: 1. dealuminated aluminosilicate zeolite crystallites, 2. a low acidity refractory

oxide binder material, and 3. a Group VIII metal hydrogenation component selected from the group consisting of platinum, palladium, and nickel. A significant further feature of the inventive process is that the feedstock that is catalytically dewaxed has specifically defined properties and a high sulfur and nitrogen content.

The primary Banta reference teaches the simultaneous hydrodesulfurization and hydrodewaxing of a hydrocarbon feedstock using a catalyst having a composition that is significantly different from the catalyst that is taught by the secondary Moureaux reference. The Moureaux reference teaches a two-step process with the first step providing a hydrotreating function for the purpose of removing sulfur and nitrogen from the feedstock prior to passing the thus-treated feedstock to the second step. The second step utilizes a noble metal catalyst that is sensitive to poisoning by sulfur and nitrogen. The first step is to provide for sulfur removal for the purpose of protecting the noble metal catalyst of the second step.

There is nothing in the teachings of the two references to suggest that the catalyst of the Moureaux reference may be used in a single step process for the purpose of simultaneously desulfurizing and dewaxing a feedstock, especially, since, the Moureaux reference is explicit about the sensitivity of noble metal catalysts to sulfur poisoning.

### **Claims 5 and 38**

Claims 5 and 38 further define the low acidity refractory oxide binder component of the dewaxing catalyst of the process to be silica.

It is further recognized that the references do not indicate that it is preferable for a dewaxing catalyst to include dealuminated aluminosilicate zeolite crystallites and a Group VIII metal selected from platinum, palladium or nickel in combination with silica material that is essentially free of alumina as a binder in the processing of a high sulfur feed having the properties and derived from the source specified in the applicants' claims. The applicants' specification points out that the use of silica as the low acidity refractory oxide binder of the dewaxing catalyst is preferred and the examples present performance data for such a catalyst in comparison to other catalysts.

The Applicants' results of comparative tests are presented in Table 4 of the specification. The comparison catalyst includes an untreated ZSM-5 zeolite, alumina binder and nickel, and the inventive catalyst includes a dealuminated (by AHS treatment) ZSM-5 zeolite, silica binder, and nickel (Ex. 2 catalyst) or platinum (Ex. 1 catalyst). The gas oil feedstock of the tests contained a

significant sulfur concentration. See the specification at Table 3, page 16. As indicated in the Applicants' examples, the inventive catalyst exhibited a higher activity in providing for a given cloud point. See the specification at page 17, lines 10-15 and Table 4. Also, the inventive catalyst exhibited a high stability in spite of the significant presence of sulfur in the feedstock. See the specification at page 18, lines 9-11. The description in the Applicants' specification and the experimental data presented in its examples demonstrate that the claimed process provides certain unexpected benefits over certain comparative processes.

#### **Claims 6, 7, 39 and 40**

Claims 6, 7, 39 and 40 further define the aluminosilicate zeolite crystallites of the claimed catalyst to be a specific type of zeolite as recited in the claims. For the reasons expressed above, these claims are patentable over the combination of references cited in the Examiner's rejection.

#### **Claims 8, 9, 14, 41, 42, and 43**

One of the unique features recited in claims 8, 9, 14, 41, 42, and 43 is the requirement that the extrudate of zeolite and low acidity binder, e.g. silica, of the catalyst composition of the claimed process is subjected to an AHS treatment as opposed to the zeolite itself being subjected to an AHS treatment. The Examiner's cited references do not teach the Applicants' process that uses the recited catalyst when it is prepared in such a way that its extrudate of silica and zeolite, as opposed to the zeolite alone, is surface dealuminated.

#### **Claim 15**

Claim 15 further defines the Group VIII metal hydrogenation component of the catalyst of the claimed process to be the noble metal of palladium. The Moureaux patent indicates that the noble metal catalysts are sensitive to sulfur exposure and, thus, it teaches the need for a first step for hydrotreating a sulfur containing feedstock prior to catalytic dewaxing with a noble metal dewaxing catalyst.

#### **Claims 16, 17, and 18**

Claim 17 defines a process that is similar to that of claim 1 with the exception that the hydrogenation component of the dewaxing catalyst is specified as nickel. Claim 16 is dependent from claim 1 and further defines the hydrogenation component of the dewaxing catalyst as

nickel. The references cannot properly be combined in a manner that provides for a process for catalytically dewaxing a high sulfur content feedstock, having the claimed properties, using a catalyst comprising a dealuminated aluminosilicate zeolite, a low acidity refractory oxide binder that is essentially free of alumina, and a nickel hydrogenation component. The Banta patent teaches a single reactor stage process that utilizes a catalyst comprising a refractory oxide support, a zeolite, and a hydrogenation component from Group VIA metal and/or Group VIII metal, but the Moureaux patent teaches a two reactor stage process in which the second stage includes the use of a dewaxing catalyst that uses a noble metal that is sensitive to sulfur poisoning. There is nothing to lead one skilled in the art to combine the teachings of the two cited references to provide the claimed catalyst for use in dewaxing a high sulfur content feedstock and, especially, a feedstock as recited in the claims.

#### **Claim 19**

Claim 19 further defines the low acidity refractory oxide binder of the recited dewaxing catalyst of the claimed process as being silica. The arguments presented above in response to the Examiner's arguments against patentability of the claims and those presented above concerning patentability with respect to claims 16-18 and further with respect to claims 5 and 38 are also applicable to the invention of claim 19.

#### **Claims 20 and 21**

Claims 20 and 21 further define the aluminosilicate zeolite crystallites of the catalyst having a nickel hydrogenation component of the claimed process. The arguments presented above in response to the Examiner's arguments against patentability of the claims and those presented above with respect to claims 16, 17 and 18 are also applicable to the invention of claims 20 and 21.

#### **Claims 22, 23, and 24**

One unique feature of these claims is the requirement that the extrudate of zeolite and low acidity binder, e.g. silica, of the catalyst composition of the claimed process is subjected to an AHS treatment as opposed to the zeolite itself being subjected to an AHS treatment. The Examiner's cited references do not teach the Applicants' process that uses the recited catalyst

when it is prepared in such a way that its extrudate of silica and zeolite, as opposed to the zeolite alone, is surface dealuminated, with the hydrogenation component of the catalyst being nickel.

#### **Claim 25**

Claim 25 further defines the catalyst of the claimed process as having an absence of a Group VIB metal component. None of the Examiner's cited references suggest that a dewaxing catalyst containing a nickel hydrogenation component and a silica and zeolite extrudate that has been dealuminated by an AHS treatment that preferably has an absence of a Group VIB metal component.

#### **Claims 26 and 44**

Claims 26 and 44 further define the catalyst of the claimed process as having an absence of a Group VIB metal component. The catalyst includes a hydrogenation component selected from platinum, palladium and nickel but having an absence of a Group VIB metal component, and a silica and zeolite extrudate that has been dealuminated by an AHS treatment. The Examiner's cited references do not suggest that a dewaxing catalyst as defined in claims 26 and 44 preferably has an absence of a Group VIB metal component.

#### **Claims 10, 27, and 28**

Independent claim 27 is directed to a process that catalytically dewaxes a solvent extracted waxy raffinate feedstock made by subjecting a vacuum distillate to a solvent extraction. The catalyst of this process is the same as is recited in claim 1 from which claim 10 depends. Claim 10 further limits independent claim 1 by further defining the hydrocarbon oil feed to be catalytically dewaxed as being a solvent extracted raffinate from the solvent extraction of a vacuum distillate. There are no teachings in any single reference to suggest that an extracted waxy raffinate feedstock made from a vacuum distillate boiling in a specifically defined boiling range and having a high sulfur content may be catalytically dewaxed using a catalyst as defined in the claims. The tertiary reference of Garwood cited by the Examiner presents a completely different dewaxing catalyst than those of the primary and secondary references and there is no mention in the Garwood patent of its feed containing sulfur. The teachings of the primary reference actually suggest the lack of combinability with the tertiary reference of Garwood.

### **Claim 29**

Claim 29 further defines the low acidity refractory oxide binder component of the dewaxing catalyst of the process to be silica. The feedstock that is contacted with the dewaxing catalyst is from the solvent extraction of a vacuum distillate to yield a solvent extracted waxy raffinate that is subjected to the catalytic dewaxing.

It is further recognized that the references do not indicate that it is preferable for a dewaxing catalyst to include dealuminated aluminosilicate zeolite crystallites and a Group VIII metal selected from platinum, palladium or nickel in combination with silica material that is essentially free of alumina as a binder in the processing of a high sulfur feed having the properties and derived from the source specified in the applicants' claims. The applicants' specification points out that the use of silica as the low acidity refractory oxide binder of the dewaxing catalyst is preferred and the examples present performance data for such a catalyst in comparison to other catalysts.

The Applicants' results of comparative tests are presented in Table 4 of the specification. The comparison catalyst includes an untreated ZSM-5 zeolite, alumina binder and nickel, and the inventive catalyst includes a dealuminated (by AHS treatment) ZSM-5 zeolite, silica binder, and nickel (Ex. 2 catalyst) or platinum (Ex. 1 catalyst). The gas oil feedstock of the tests contained a significant sulfur concentration. See the specification at Table 3, page 16. As indicated in the Applicants' examples, the inventive catalyst exhibited a higher activity in providing for a given cloud point. See the specification at page 17, lines 10-15 and Table 4. Also, the inventive catalyst exhibited a high stability in spite of the significant presence of sulfur in the feedstock. See the specification at page 18, lines 9-11. The description in the Applicants' specification and the experimental data presented in its examples demonstrate that the claimed process provides certain unexpected benefits over certain comparative processes.

### **Claims 30 and 31**

Claims 30 and 31 further define the aluminosilicate zeolite crystallites of the claimed catalyst to be a specific type of zeolite as recited in the claims. For the reasons expressed above, these claims are patentable over the combination of references cited in the Examiner's rejection.

### **Claims 32, 33, and 34**

One of the unique features recited in claims 32, 33 and 34 is the requirement that the extrudate of zeolite and low acidity binder, e.g. silica, of the catalyst composition of the claimed process is subjected to an AHS treatment as opposed to the zeolite itself being subjected to an AHS treatment. The Examiner's cited references do not teach the Applicants' process that uses the recited catalyst when it is prepared in such a way that its extrudate of silica and zeolite, as opposed to the zeolite alone, is surface dealuminated. Furthermore, the cited references do not teach the use of this particular catalyst for dewaxing a solvent extracted waxy raffinate having a high sulfur content and made by the solvent extraction of a vacuum distillate having a boiling range of from 300 °C to 620 °C.

### **Claim 35**


Claim 35 further defines the catalyst of the claimed process as having an absence of a Group VIB metal component. The catalyst includes a hydrogenation component selected from platinum, palladium and nickel but having an absence of a Group VIB metal component, and a silica and zeolite extrudate that has been dealuminated by an AHS treatment. The Examiner's cited references do not suggest that a dewaxing catalyst as defined in claim 35 preferably has an absence of a Group VIB metal component, especially in the dewaxing of a solvent extracted waxy raffinate having a high sulfur content and made by the solvent extraction of a vacuum distillate having a boiling range of from 300 °C to 620 °C.

### **C. Conclusion**

For all the foregoing reasons, it is submitted that all of the claims under appeal (claims 1, 3, 5-10 and 14-44) are patentable over the cited references. Accordingly, it is respectfully requested that the action of the Examiner in finally rejecting these claims be reversed, and the application be passed to issue.

Respectfully submitted,

GUY BARRE, JEAN-PAUL DARNANVILLE,  
and LAURENT GEORGES HUVE

By   
\_\_\_\_\_  
Their Attorney, Charles W. Stewart  
Registration No. 34,023  
(713) 241-0360

P. O. Box 2463  
Houston, Texas 77252-2463

## CLAIMS APPENDIX

1. A process for the catalytic dewaxing of a hydrocarbon oil feed obtained by the vacuum distillation of the residue of an atmospheric distillation of a crude petroleum feedstock, wherein said hydrocarbon oil feed has a boiling range between 300 °C and 620 °C includes waxy molecules and more than 1000 ppmw of sulphur or sulphur containing compounds and said hydrocarbon oil feed has not been subjected to a hydrotreating step to reduce sulfur and nitrogen content, by contacting said hydrocarbon oil feed under catalytic dewaxing conditions with a catalyst composition comprising a Group VIII metal hydrogenation component selected from the group consisting of platinum, palladium and nickel, dealuminated aluminosilicate zeolite crystallites and a low acidity refractory oxide binder material which is essentially free of alumina.

Claim 2 (Canceled).

3. The process of claim 1, in which said hydrocarbon oil feed further comprises more than 10 ppmw of nitrogen or nitrogen containing compounds.

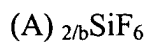
Claim 4 (Canceled).

5. The process of claim 1, in which the low acidity binder is silica.

6. The process of claim 1, in which the aluminosilicate zeolite crystallites have a Constraint Index of between 2 and 12.

7. The process of claim 6, in which the aluminosilicate zeolite crystallites include MFI type zeolite.

8. The process of claim 1, in which the dealuminated aluminosilicate zeolite crystallites are obtained by contacting the zeolite crystallites with an aqueous solution of a fluorosilicate salt wherein the fluorosilicate salt is represented by the formula:





in which 'A' is a metallic or non-metallic cation other than H<sup>+</sup> having the valence 'b'.

9. The process of claim 8, in which an extrudate of the aluminosilicate zeolite crystallites and the low acidity binder is contacted with the aqueous solution of the fluorosilicate salt.

10. The process of claim 1, in which said hydrocarbon oil feed is a solvent extracted waxy raffinate that has been obtained further by the solvent extraction of the vacuum distillate obtained by the vacuum distillation of the residue of said atmospheric distillation of said crude petroleum feedstock.

Claims 11-13 (canceled).

14. The process of claim 8, where 'A' is an ammonium cation.

15. The process of claim 1, in which the hydrogenation component is palladium.

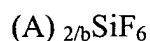
16. The process of claim 1, in which the hydrogenation component is nickel.

17. A process for the catalytic dewaxing of a hydrocarbon oil feed obtained by the vacuum distillation of the residue of an atmospheric distillation of a crude petroleum feedstock, wherein said hydrocarbon oil feed has a boiling range between 300 °C and 620 °C includes waxy molecules and more than 1000 ppmw of sulphur or sulphur containing compounds and said hydrocarbon oil feed has not been subjected to a hydrotreating step to reduce sulfur and nitrogen content, by contacting said hydrocarbon oil feed under catalytic dewaxing conditions with a catalyst composition comprising a nickel hydrogenation component, dealuminated aluminosilicate zeolite crystallites and a low acidity refractory oxide binder material which is essentially free of alumina.

18. The process of claim 17, wherein said hydrocarbon oil feed further comprises more than 10 ppmw of nitrogen or nitrogen containing compounds.

19. The process of claim 18, wherein said low acidity binder is silica.

20. The process of claim 19, wherein said aluminosilicate zeolite crystallites have a Constraint Index of between 2 and 12.
21. The process of claim 20, wherein said aluminosilicate zeolite crystallites include MFI type zeolite.
22. The process of claim 21, wherein said dealuminated aluminosilicate zeolite crystallites are obtained by contacting the zeolite crystallites with an aqueous solution of a fluorosilicate salt wherein the fluorosilicate salt is represented by the formula:



in which 'A' is a metallic or non-metallic cation other than H<sup>+</sup> having the valence 'b'.

23. The process of claim 22, wherein an extrudate of the aluminosilicate zeolite crystallites and the low acidity binder is contacted with the aqueous solution of the fluorosilicate salt.
24. The process of claim 23, wherein 'A' is an ammonium cation.
25. The process of claim 24, wherein said catalyst composition has an absence of a Group VIB metal component.
26. The process of claim 9, wherein said catalyst composition has an absence of a Group VIB metal component.
27. A catalytic dewaxing process, comprising:

vacuum distilling a residue from an atmospheric distillation of a crude petroleum feedstock that contains a sulfur compound and a nitrogen compound to yield a vacuum distillate having a boiling range between 300 °C and 620 °C;

subjecting said vacuum distillate to a solvent extraction with a solvent to thereby yield a solvent extracted waxy raffinate having a reduced aromatics content from that of said vacuum distillate, wherein said solvent extracted waxy raffinate contains waxy molecules and more than 1000 ppmw of sulfur or sulfur containing compounds; and

without being subjected to a hydrotreating step to reduce the sulfur and nitrogen content of said solvent extracted waxy raffinate, contacting said solvent extracted waxy raffinate, under catalytic dewaxing conditions, with a catalyst composition comprising dealuminated aluminosilicate zeolite crystallites, a low acidity refractory oxide binder material which is essentially free of alumina, and a Group VIII metal hydrogenation component selected from the group consisting of platinum, palladium and nickel.

28. A dewaxing process as recited in claim 27, wherein said solvent extracted waxy raffinate further contains more than 10 ppmw of nitrogen or nitrogen compounds.

29. A dewaxing process as recited in claim 28, wherein the low acidity refractory oxide binder of said catalyst composition is silica.

30. A dewaxing process as recited in claim 29, wherein the dealuminated aluminosilicate zeolite crystallites of said catalyst composition have a Constraint Index of between 2 and 12.

31. A dewaxing process as recited in claim 30, wherein the dealuminated aluminosilicate zeolite crystallites of said catalyst composition include MFI type zeolite.

32. A dewaxing process as recited in claim 31, wherein the dealuminated aluminosilicate zeolite crystallites of said catalyst composition are obtained by contacting the zeolited crystallites with an aqueous solution of a fluorosilicate salt wherein the fluorosilicate salt is represented by the formula:  $(A)_{2/b}SiF_6$  in which 'A' is a metallic or non-metallic cation other than  $H^+$  having the valence 'b'.

33. A dewaxing process as recited in claim 32, wherein in the preparation of said catalyst composition the dealuminated aluminosilicate zeolite crystallites and low acidity refractory oxide

binder material are formed into an extrudate and then contacted with said aqueous solution of fluorosilicate salt prior to the incorporation into said extrudate said Group VIII metal hydrogenation component.

34. A dewaxing process as recited in claim 33, wherein 'A' is an ammonium cation.

35. A dewaxing process as recited in claim 34, wherein said catalyst composition has an absence of a Group VIB metal component.

36. A catalytic dewaxing process, comprising:

vacuum distilling a residue from an atmospheric distillation of a crude petroleum feedstock that contains a sulfur compound and a nitrogen compound to yield a vacuum distillate having a boiling range between 300 °C and 620 °C and containing more than 1000 ppmw of sulfur or sulfur containing compounds; and

without being subjected to a hydrotreating step to reduce the sulfur or nitrogen content of said vacuum distillate, contacting said vacuum distillate, under catalytic dewaxing conditions, with a catalyst composition comprising dealuminated aluminosilicate zeolite crystallites, a low acidity refractory oxide binder material which is essentially free of alumina, and a Group VIII metal hydrogenation component selected from the group consisting of platinum, palladium and nickel.

37. A dewaxing process as recited in claim 36, wherein said vacuum distillate further contains more than 10 ppmw of nitrogen or nitrogen compounds.

38. A dewaxing process as recited in claim 37, wherein the low acidity refractory oxide binder of said catalyst composition is silica.

39. A dewaxing process as recited in claim 38, wherein the dealuminated aluminosilicate zeolite crystallites of said catalyst composition have a Constraint Index of between 2 and 12.

40. A dewaxing process as recited in claim 39, wherein the dealuminated aluminosilicate zeolite crystallites of said catalyst composition include MFI type zeolite.
41. A dewaxing process as recited in claim 40, wherein the dealuminated aluminosilicate zeolite crystallites of said catalyst composition are obtained by contacting the zeolited crystallites with an aqueous solution of a fluorosilicate salt wherein the fluorosilicate salt is represented by the formula:  $(A)_{2/b}SiF_6$  in which 'A' is a metallic or non-metallic cation other than  $H^+$  having the valence 'b'.
42. A dewaxing process as recited in claim 41, wherein in the preparation of said catalyst composition the dealuminated aluminosilicate zeolite crystallites and low acidity refractory oxide binder material are formed into an extrudate and then contacted with said aqueous solution of fluorosilicate salt prior to the incorporation into said extrudate said Group VIII metal hydrogenation component.
43. A dewaxing process as recited in claim 42, wherein 'A' is an ammonium cation.
44. A dewaxing process as recited in claim 43, wherein said catalyst composition has an absence of a Group VIB metal component.

## **EVIDENCE APPENDIX**

There are no additional arguments as relied upon by the Applicants.

## **RELATED PROCEEDINGS APPENDIX**

There are no related appeals or other proceedings.